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EXAMINER	
DOLE, TIMOTHY J	

ART UNIT	PAPER NUMBER
2858	

DATE MAILED: 10/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/647,227	CHUNG ET AL.	
	Examiner	Art Unit	
	Timothy J. Dole	2858	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-15 is/are rejected.

7)☒ Claim(s) 16-22 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 26 August 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 9, 11-13 and 17-22 are objected to because of the following informalities: "the first terminal" should be "the first amplifier" on the first line of page 14. Claims 11-13 are objected to for depending on objected claim 9. Claim 17 recites the limitations "the third amplifier" and " the Zener diode", in the second and third lines, which lack antecedent basis. Claim 18 recites the limitations "the third amplifier" and " the Zener diode", in the second and third lines, which lack antecedent basis. Claim 19 recites the limitation " the Zener diode", in the second line, which lacks antecedent basis. Claim 20 recites the limitation "the bandgap reference voltage generating circuit" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. Claims 21 and 22 are objected to for depending on objected independent claim 20. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-6, 8-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pechstein in view of Katsube et al.

Referring to claim 1, Pechstein discloses an electronic circuit for ion sensor, comprising: a bridge sensing circuit (fig. 1) comprising an input terminal (fig. 1 (3)) and a sensing output terminal (fig. 1 (ϕD)), for sensing ion concentration of a solution

(abstract), wherein the bridge sensing circuit comprises an ion sensing element (fig. 1 (2)), one terminal of which, coupled to the sensing output terminal for delivering the signal of ion concentration (fig. 1); and a circuit (fig. 1 (U_{Bss})), wherein a reference voltage (fig. 1 ($+U_B$)) is inputted into one input terminal of the circuit, while the other input terminal is coupled to the sensing output terminal of the bridge sensing circuit (fig. 1) for delivering a differential voltage to the input terminal of the bridge sensing circuit such that the ion sensing element senses the ion concentration under the conditions of constant current and constant voltage (column 4, lines 52-56).

Pechstein does not disclose the ion sensing element has a reference electrode coupled to a ground or that the circuit is a differential amplifying circuit.

Katsube et al. discloses an ion sensor, which has a reference electrode (fig. 22 (115)) coupled to a ground (fig. 22) and a differential amplifying circuit (fig. 22) for delivering a differential voltage to the input terminal of the ion sensing element so that it senses the ion concentration under the conditions of constant current and constant voltage (column 18, lines 24-36).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the reference electrode and differential amplifying circuit of Katsube et al. into the sensor of Pechstein for the purpose of providing a common ground for multiple sensors whereby making it possible to obtain stable and accurate measurements (column 18, lines 37-44).

Referring to claims 2 and 9, Pechstein discloses the sensor as claimed, wherein the bridge sensing circuit further comprises: a first amplifier (fig. 1 (OP)); a first

impedance element (fig. 1 (R3)), coupled between the input terminal of the bridge sensing circuit and the positive terminal of the first amplifier (fig. 1); a second impedance element (fig. 1 (R2)), coupled between the positive terminal and the output terminal of the first amplifier (fig. 1); a third impedance element (fig. 1 (R1)), coupled to the input terminal of the bridge sensing circuit and the negative terminal of the first amplifier (fig. 1) thereby determining the constant current wherein the first amplifier, the first impedance element, the second impedance element, the third impedance element, and the ion sensing element constitute a bridge network (column 5, lines 15-17) such that the ion sensing element operates under the conditions of constant drain-source voltage and constant drain current (column 4, lines 52-56).

Referring to claims 3, 4, 10 and 11, Pechstein discloses the sensor as claimed, wherein the ion sensing element is an ISFET (fig. 1 (2)), whose drain terminal is coupled to the negative terminal of the first amplifier (fig. 1 (5)), the source terminal is coupled to the output terminal of the first amplifier (fig. 1).

Pechstein does not disclose the reference electrode is coupled to a ground.

Katsube et al. discloses the reference electrode is coupled to a ground (fig. 22).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the reference electrode of Katsube et al. into the sensor of Pechstein for the same purpose as given in claim 1, above.

Referring to claims 5 and 12, Pechstein discloses the sensor as claimed except wherein a first capacitor is further coupled between the positive terminal of the first amplifier and the ground terminal.

It would have been obvious to one skilled in the art at the time of the invention to incorporate the capacitor to ground into the sensor of Pechstein for the purpose of providing a better measurement by smoothing the signal input into the amplifier so that any ripple on the signal is minimized and amplified less.

Referring to claims 6 and 13, Pechstein discloses the sensor as claimed, wherein a second capacitor is further coupled between the negative terminal and the output terminal of the first amplifier (fig. 1, and column 4, lines 1-4).

Referring to claim 8, Pechstein discloses an electronic circuit for ion sensor, comprising: a bridge sensing circuit (fig. 1) which has an input terminal (fig. 1 (3)) and a sensing output terminal (fig. 1 (ϕD)), for sensing ion concentration of a solution, wherein the bridge sensing circuit comprises an ion sensing element (fig. 1 (2)), one terminal of which, coupled to the sensing output terminal for delivering the ion concentration (fig. 1), a voltage generating circuit for generating a constant voltage (fig. 1 (ϕREF)) according to a negative voltage source; a follower type impedance converter circuit (fig. 1 (6)) for amplifying the constant voltage as a reference voltage; a circuit (fig. 1 (U_{Bss})), the reference voltage being inputted into one input terminal of which circuit, the other input terminal being coupled to the sensing output terminal of the bridge sensing circuit (fig. 1) for delivering a differential voltage to the input terminal of the bridge sensing circuit such that the ion sensing element senses the ion concentration under the conditions of constant drain current and constant drain-source voltage (column 4, lines 52-56).

Pechstein does not disclose the ion sensing element has a reference electrode coupled to a ground or that the circuit is a differential amplifying circuit.

Katsube et al. discloses an ion sensor, which has a reference electrode (fig. 22 (115)) coupled to a ground (fig. 22) and a differential amplifying circuit (fig. 22) for delivering a differential voltage to the input terminal of the ion sensing element so that it senses the ion concentration under the conditions of constant current and constant voltage (column 18, lines 24-36).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the reference electrode and differential amplifying circuit of Katsube et al. into the sensor of Pechstein for the same purpose as given in claim 1, above.

Referring to claim 15, Pechstein discloses the sensor as claimed, wherein the follower type impedance converter circuit further comprises a third amplifier (fig. 1 (6)).

4. Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pechstein and Katsube et al. as applied to claim 1 above, and further in view of Sohn.

Referring to claims 7 and 14, Pechstein as modified discloses the sensor as claimed except wherein the differential amplifying circuit further comprises: a second amplifier, whose output terminal is coupled to the input terminal of the bridge sensing circuit, a fourth impedance element, which is coupled between the negative terminal of the second amplifier and the reference voltage; a fifth impedance element, which is coupled between the sensing output terminal of the bridge sensing circuit and the positive terminal of the second amplifier; a sixth impedance element, which is coupled between the positive terminal of the second amplifier and a ground; and a seventh impedance

element, which is coupled between the output terminal and the negative terminal of the second amplifier.

Sohn discloses an ion sensor wherein the differential amplifying circuit comprises: a second amplifier (fig. 4), whose output terminal is coupled to the input terminal of the bridge sensing circuit, a fourth impedance element (fig. 4), which is coupled between the negative terminal of the second amplifier and the reference voltage; a fifth impedance element (fig. 4), which is coupled between the sensing output terminal of the bridge sensing circuit and the positive terminal of the second amplifier; a sixth impedance element (fig. 4), which is coupled between the positive terminal of the second amplifier and a ground; and a seventh impedance element (fig. 4), which is coupled between the output terminal and the negative terminal of the second amplifier.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the differential amplifying circuit of Sohn into the sensor of Pechstein as modified for the purpose of providing a conventional circuit for differentially amplifying two signals (column 3, lines 9-10).

Allowable Subject Matter

5. Claim 16 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patent is cited to show the state of the art with respect to ion sensors.

USPN 4,645,583 to Shirai et al.: This patent shows an apparatus for sensing ion concentration using an ISFET with a reference electrode coupled to ground.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J. Dole whose telephone number is (571) 272-2229. The examiner can normally be reached on Mon. thru Fri. from 8:00 to 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, N. Le can be reached on (571) 272-2233. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TJD

N. Le
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